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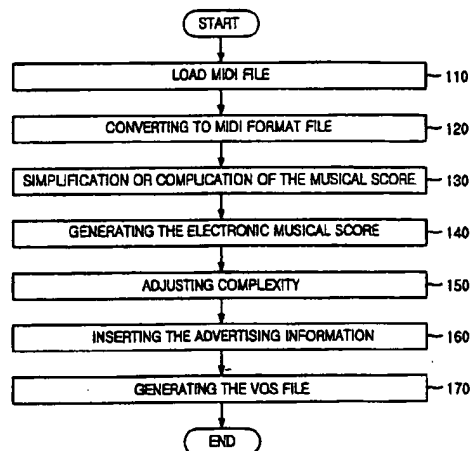
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- (71) Applicant (for all designated States except US):  
**HANSEULSOFT CO., LTD. [KR/KR];** Hyunjin Building, 2nd floor, 798-30, Yeoksam-dong, Kangnam-gu, Seoul 135-080 (KR).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): **KIM, Yun-Jong [KR/KR];** San 69, Namhyun-dong, Kwanak-gu, Seoul 151-080 (KR).
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(54) Title: **METHOD AND APPARATUS FOR PLAYING MUSICAL INSTRUMENTS BASED ON A DIGITAL MUSIC FILE**



(57) Abstract: The present invention relates to a system and method for playing musical instruments using a digital music file. The method for playing the musical instrument based on a computing system includes the steps of: generating a digital music file which stores a play order for each musical instrument and sound data for each musical instrument by partitioning the digital music file depending on the musical instruments; inputting music type data and musical instrument type data by a user; displaying an electronic score at a real-time wherein musical notes corresponding to each instrument to play the music are represented, selected from the music file; and playing the music according to the displayed electronic score by synthesizing a designated sound manipulated by the user and a background sound of the music wherein the designated sound is omitted. Accordingly, at least one user can play the music based on the music file. At the same time, the user can play the music, selecting desired instruments and watching the displayed electronic score.

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METHOD AND APPARATUS FOR PLAYING MUSICAL INSTRUMENTS  
BASED ON A DIGITAL MUSIC FILE

Technical Field

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The present invention relates to a method of converting a digital music file, in which tracks are classified on the basis of musical instruments to be played in such as a MIDI (musical Instrument Digital Interface), to a musical performance file  
10 (hereinafter, referred to as a VOS (Virtual Orchestra System) file) which makes a direction of performance and playing back for each musical instrument, a musical performance system and method that one or more users select his own musical instrument and play the music through the electronic musical score displayed  
15 on a screen based on the VOS file, and a computer readable medium storing programs for realizing them.

Background Art

20 MIDI (Musical Instrument Digital Interface) is a kind of music file which can automatically play back sound or music through the electronic devices, and it has international standards for the compatibility of the data exchange among electronic musical instruments. Most electronic musical  
25 instruments can send/receive the data based on MIDI's standards. For example, the electronic musical instruments for domestic use are divided into the electronic organ, the electronic piano, the

electronic keyboard, etc. and these instruments, that synthesize and output sound waves using the well-known analog or digital circuit, also follows the MIDI's standards.

In other words, MIDI has been considered as international  
5 standards for the compatibility in transmitting information about playing of musical instruments, and recommends the exclusive five pin-cable for sending/receiving channel and system messages. Also, MIDI recommends that the channel message may include the performance information, such as scale interval,  
10 dynamic and transformation of timbre programs, etc.

Recently, there are many cases where the data can be shared with PCs (Personal Computers), and the electronic musical instruments can be controlled by the PCs. For the PCs to control the musical instruments with a MIDI port, the signals in the PC  
15 are required to be converted to MIDI signals for electronic musical instruments, and then the MIDI interface is necessarily required for this purpose. The MIDI interfaces may be divided into the intelligent type with CPU and the non-intelligent type without it. In the present technologies, sixteen-different  
20 channel information can be transmitted through just one cable, therefore the MIDI file, which has the sounds of sixteen different musical instruments, can be easily transmitted (it is obvious that the extension of the channel information is available to the ordinary skilled in the art).

25 The present invention is suggested as a technique using these environments and resources.

As a prior arts, "Beatmania" (it is the brandname) system

of "KONAMI", which is well known as a music playing game system, will be explained concretely referring to Fig. 1.

Fig. 1 is a block diagram illustrating a method for playing a music through the "Beatmania" system.

5       As shown in Fig. 1, "Beatmania" of "KONAMI" is a music playing simulation game system, which directs a playing operation to users at a predetermined point of time and, when the users get into operation based on the direction, executes the manipulation such as a mixing of a preset playing sound wave  
10   (user input sound wave) and a effect sound wave (background music except the user input sound wave) given by Disc Jockey (DJ). It directs the timing of playing operation to the user using an indicator, a kind of electronic musical score, and the user can play the music with five buttons and one turntable. According  
15   to the result of user's playing operation, "Beatmania" synthesizes and outputs the play sound wave and the effect sound wave.

Although, this "Beatmania" system is useful in that it makes the user play the music easily by indicating the timing  
20   of playing operations, it requires a lot of efforts for professional musicians to compose the whole piece of music, because in the "Beatmania" system, the playing sound wave (user input wave) and the background sound wave should be separately designed for each musical instrument selected by the user. That  
25   is, in this system, the design of the play sound wave (user input wave) and the background sound wave should be repeatedly made as many as the number of musical instruments to be selected by

the user, because it is impossible to design the whole music at one time by partitioning the musical notes depending on each musical instrument.

Also it has another problem in that once the music is made  
5 for "Beatmania", the change of the file requires the same complex procedures as making it first, because the musical performance file made through these procedures is in a type of a wave file.

Even if the musical performance file is compressed, it needs a few or a few dozens of megabyte because the file for the  
10 music playing game through these procedures is wave file, therefore the transmission of it needs large bandwidth. In result, in the current PC version, "Beatmania" has a technical limitation to a downgrade sound quality due to the reduction of an amount of data.

15

#### Disclosure of the Invention

Therefore, to solve the above problems, it is an object of the present invention to provide a method of converting a music  
20 file to a VOS file by partitioning the musical notes for directing musical operation and playing sounds depending on each musical instrument in the computing system using digital music file (for example MIDI files), and a computer readable medium storing programs for implementing the above-mentioned method.

25 It is another object of the present invention to provide a music playing system, which one or more users select their own musical instruments and play the music, showing electronic

musical scores displayed on the screen based on the VOS file; its method; and a computer readable medium storing programs for realizing them.

To achieve the first purpose of the invention, a method  
5 for converting a digital music file to a music playing file for each musical instrument comprises the steps of: classifying MIDI messages in MIDI files by type and storing them to memory; converting the delta time information of MIDI message to the absolute time information; and generating a VOS file by  
10 constructing a playing note message (for example, a user can select just one musical instrument through the whole playing time, change musical instruments during the playing, or plural users can play simultaneously with each their own musical instrument).

A method of converting file to the VOS file by classifying  
15 musical notes for playing each musical instrument comprises: classifying MIDI message and storing them to memory for obtaining necessary information from the message of MIDI file, in the apparatus with processor which converts a digital music file to a music playing file to be played for each musical instrument;  
20 carrying out the time conversion which change the delta time information to the absolute time information, and the classification of users based on relation to the musical instruments; generating a electronic score by simplifying the playing style to make it easy to play the musical instruments;  
25 generating a digital music file, which represents the notes in the timing of playing operation by partitioning the notes according to the playing order and musical instrument (track),

from the generated electronic musical score by changing the position of the notes, omitting some notes, adjusting the complexity of performance; and inserting additional information (advertising message, image, or sound clip for some corporations, goods, music) to said complexity coordinated musical score, and deciding the time to show the additional information to users.

To accomplish said first purpose of the invention, a computer readable medium storing program code for realizing the present invention comprises: a first function of classifying MIDI message in MIDI files and storing them to memory; a second function of converting the delta time information of MIDI message to the absolute time information; and a third function of generating a VOS file by constructing a playing note message.

Also, a computer readable medium storing program code for realizing the present invention comprises: a first function of classifying MIDI message and storing them to memory for obtaining necessary information from the message of MIDI file, in the apparatus with processor which converts a digital music file to a music playing file to be played for each musical instrument; a second function of carrying out the time conversion which change the delta time information to the absolute time information, and the classification of users based on relation to the musical instruments; a third function of generating a electronic score by simplifying the playing style to make it easy to play the musical instruments; a fourth function of generating a digital music file, which represents the notes in the timing of playing

operation by partitioning the notes according to the playing order and musical instrument (track), from the generated electronic musical score by changing the position of the notes, omitting some notes, adjusting the complexity of performance;  
5 and a fifth function of inserting additional information (advertising message, image, or sound clip for some corporations, goods, music) to said complexity coordinated musical score, and deciding the time to show the additional information to users.

To achieve the second purpose, the music playing system of  
10 the present invention comprises: music file providing means for providing a music file to represent notes for each musical instrument at the timing of playing operation by classifying the notes depending on a playing order and a track corresponding to the musical instrument for said music; musical score display  
15 means for displaying each note for the musical instrument to be played as an electronic musical score; at least one playing operation input means for getting an playing operation input from the users according to the playing order of notes in the electronic musical score displayed by said musical score display  
20 means; musical processing means for storing a digital music file, converting the notes in a score to the electronic musical score representing the playing order, and providing the notes to the musical score display means, and outputting a designated sound manipulated by the playing operation input means and the  
25 background sound except the designated sound; music playing means for synthesizing and playing the designated sound and the background sound from the musical processing means; and output



means for outputting the music played by the music playing means.

To achieve the second purpose, the music playing method of the present invention includes the steps of: generating music file representing the notes in the timing of playing order by  
5 partitioning the notes depending on the track of the playing order and musical instrument for the music; getting inputs of the title of music and the musical instrument to be played from users; displaying electronic musical notes for musical instruments to be played as an electronic musical score that shows the playing  
10 order of the notes on a screen at a real-time; and synthesizing and playing the designated sound manipulated by users and the background sound except the designated sound according to the musical score displayed on the screen.

Further, to achieve the second purpose of the present  
15 invention, a computer readable medium storing the program code for realizing the present invention includes the function of: generating music files for representing the notes for the music in the timing of playing order by partitioning the notes according to the playing order and musical instrument (track) in the music  
20 playing device with processor; getting inputs of the title of music and the musical instrument to be played from users; displaying the musical notes for said music to be played as an electronic musical score that shows the playing order of the notes on a screen at a real-time; and synthesizing and playing the  
25 designated sound manipulated by users and the background sound except the designated sound according to the musical score displayed on the screen.

Brief Description of the Drawings

FIG. 1 is a block diagram for explaining a prior musical  
5 playing system of "Beatmania";

FIG. 2 is a flowchart showing a method of converting a digital music file to a musical performance file for each musical instrument in accordance with the present invention;

FIG. 3 is a comparative diagram of delta time information  
10 of a digital music file and absolute time information of a VOS file in accordance with the present invention;

FIG. 4 is a flowchart illustrating a method of converting delta time information to absolute time information in accordance with the present invention;

15 FIG. 5 is a schematic view illustrating a method of generating VOS electronic score in accordance with the present invention;

FIG. 6 is a schematic view illustrating a method of adjusting the complexity during the generation of VOS electronic  
20 musical score;

FIG. 7 is a flowchart illustrating an embodiment of a music playing system in accordance with the present invention;

FIG. 8 is a schematic view illustrating a structure of the VOS file in accordance with the present invention;

25 FIG. 9 is a schematic view illustrating a playing environment of VOS in accordance with the present invention;

FIG. 10 is a schematic view illustrating a structure of

playing environment of VOS in accordance with an embodiment of the present invention;

FIG. 11 is a flowchart illustrating a method of playing music in accordance with an embodiment of the present invention;

5       FIG. 12 is a schematic view illustrating a display of an electronic score in a musical performance according to the present invention;

FIG. 13 is a schematic view illustrating the output of designated sound in the musical performance according to the  
10 present invention;

FIG. 14 is a schematic view showing an achievement of the musical performance in accordance with an embodiment of the present invention; and

FIG. 15 is a schematic view illustrating a playing  
15 environment (karaoke) using in accordance with the present invention.

#### Best mode for Carrying Out the Invention

20       The present invention makes ordinary people, who is not skilled in musical instrument, play music easily using VOS format music files. Also, without a large space such as a studio with expensive musical instruments or special facilities, the present invention enables plural users connected through the computer  
25 network to constitute a virtual orchestra by selecting each their own musical instrument and then they play a music through a VOS electronic musical score displayed on each user's screen, using

the VOS file format.

For this purpose, as a tool for getting anyone to make VOS format music files easily, the present invention provides a method of converting digital music files, such as MIDI files, to the VOS files by classifying musical notes for directing musical operations on the basis of musical instruments and playing sounds for each musical instrument, and computer readable media storing the programs for realizing the same method.

10 In the present invention, when MIDI file is previously provided for music, it may be used as a source file for the VOS file, otherwise, a MIDI file for the music should be made by a known- method and converted to the VOS file format (it means a specific file for representing the electronic score for each musical instrument for each user) so that the VOS electronic score  
15 for one or more musical instruments can be provided to the players, and the sound of selected musical instrument may be played by inputs according to the users' operations. For the reference, MIDI file is already widely used in a musical entertainment such as noraebang (karaoke) because it is not only easy and cheap to  
20 make but also excluded from voice of a specific singer (so the royalty is not expensive).

The objects, features and utilities of the present invention will be clearer through the description and attached  
25 figures in the following. Referring to the figures, the best mode in accordance with the present invention will be explained in detail.

First, a method of generating VOS file by converting the MIDI file to the VOS format file will be explained.

As illustrated in FIG. 2, to obtain necessary information from messages in a MIDI format music file, the formation of the VOS file in accordance with the present invention classifies MIDI messages on the basis of type and stores them in a memory at step 110. For the reference, the messages are divided into control messages (such as volume control, effect, etc), playing messages, and musical instrument configuration messages; etc. and a time domain of the entire message in the MIDI file is defined as a delta time. In the delta time system, all the time information of message are decided based on a time difference between the prior time information and the current time information (see FIG. 3).

During the formation of the VOS file in the present invention, the MIDI format message defined as the delta time have to be converted to those of the absolute time for a Virtual Orchestra playing.

The meaning of the delta time and absolute time is easily understood by FIG. 3 illustrating the display of the time information for playing a message. That is, in FIG. 3, the left part shows the delta time information and the right part the absolute time information.

Also, the conversion of the delta time to the absolute time can be explained by the flowchart of FIG. 4. That is, the conversion of the delta time information of the MIDI format message to the absolute time information is accomplished by an

initialization of setting the first value of the delta time as the initial value of the absolute time at step 121, and it repeatedly performs the steps of deciding if there is any message with converted delta time information at step 123 and setting  
5 the absolute time value of the current target message by adding the current delta time value of target message to the previous absolute time value until there is no more unconverted delta time messages at step 125.

Then, in a construction of the note messages for users to  
10 play, the present invention forms a VOS file so that a single user may select just one musical instrument through the whole playing time, change the instrument during the playing, or multiple users may play with each their own musical instrument simultaneously.

15 Although, in some cases, the playing operation input devices to play all octaves without any modification such as simplification may be required, but in most case ordinary people don't require to play a sophisticated music in such a way. The simplification of the playing operation is necessary so that the  
20 ordinary people play some musical instruments without excessive training, and reversely, for the specialized players, advanced playing operation is possible through the complication of the playing operation at step 130.

For example, the simplification process of a musical score  
25 will be explained in the following referring to FIG. 5 and FIG. 6.

Referring to FIG. 5, a range of all the notes can be confined

within just one octave by removing the octave element in notes ("g" of 11a and 11b in Fig. 5). Among the notes, semi-tones can be replaced with whole-tones ("e" of 11a and 11b in Fig. 5). Through these processes, the original musical score 11a can be  
5 simplified to a new type of electronic musical score 11b at step 140. However, such a new electronic musical score 11b actually has both the original information for users to direct the normal playing operation and simplified information of the playing operation.

10 Also, if necessary, additional modification, such as a change of the arrangement of the note and deletion of the notes to be played, can be made for the new style electronic score generated at step 150. For example, an editor can be used for adjusting the complexity by deleting the notes, as illustrated  
15 in FIG. 12.

On the other hand, in case that the original score has an idle time, or the electronic score is modified by changing the arrangement or deleting the notes, additional advertising information (advertising words, image, sound clip for some  
20 corporation, goods, music) can be inserted for such an idle time. In this case, the utility of VOS file is enlarged by specifying the display time with the advertising information at step 160.

Finally, the VOS file is generated at step 170.

In Fig. 7 which illustrates a structure of the music playing  
25 system in accordance with the present invention, a reference numeral 21 represents an input device, 22 a screen display device, 23 a VOS (Virtual Orchestra System) processing device, 24 a VOS

system file providing device, 25 a MIDI output device, 26 a speaker, respectively.

As illustrated in FIG. 7, the music playing system in accordance with the present invention includes the VOS file providing device 24 for supplying the VOS file, which represents the notes in the timing of playing order by classifying the notes according to playing order and musical instrument (track) for each music, the screen display device 22 for representing each note of music as an electronic musical score which shows the playing order of the notes, at least one input device 21 for getting the playing operation inputs from users according to the playing order of the notes in the electronic musical score on the screen display device 22, the VOS processing device 23 for storing the VOS file, converting the notes for each musical instrument in the VOS file to the electronic musical score, which shows the playing order, providing it to the screen display device 22 and outputting the designated sound manipulated by the input device 21 and the background sound, the MIDI output device 25 for synthesizing and playing the designated sound and the background sound from the VOS processing device 23, and the speaker 26 for outputting the music played by the MIDI output device 25.

The input device 21 is a device for getting inputs from users, which are usually keyboards, mouses, MIDI instruments, joypads and simulative musical instruments (keyboard instruments, stringed instruments, a percussion instruments, wind instruments, etc), and it may get the input from user operation



according to the playing order of notes in the electronic musical score on the screen display device 22. Here, a keyboard means a common input device used in PC system. Although a mouse doesn't have enough number of input keys as a main input device, it can  
5 be used as an assistant playing device with a keyboard or a joypad.

The screen display device 22 is a screen for showing the VOS file to users as a type of electronic musical score, which is usually a monitor, a LCD display, or a TV. Here, the electronic musical score is a kind of score, which represents  
10 the playing order of the notes for music to be played in the VOS file.

The VOS processing device 23 has several functions of loading and storing the VOS file from the VOS file providing device 24 using a network operating system (for example, Windows  
15 NT, Windows 95/98), a set top box, a game device, a noraebang (karaoke) device etc., converting the notes of VOS files for each musical instrument to the electronic musical score which shows the playing order, providing the converted electronic musical score to the screen display device 22, getting and processing  
20 user inputs, outputting the MIDI messages (that is, the designated sound manipulated by the input device 21 and the background sound excluding the designated sound) to the MIDI output device 25.

The VOS file providing device 24 is a device for providing  
25 the VOS file necessary for playing music using a network line, a hard disk, or a CD-ROM, etc. As stated in FIG. 2 to FIG. 6, the VOS file is generated by classifying the notes according to

the playing order and the musical instrument, and converting to VOS format using MIDI file. On the other hand, when there is no VOS file in a user terminal, it may be loaded from the external sources through the network, such as a remote host connected by the wire or wireless internet, or a set top box using satellites.

The MIDI output device 25 synthesizes and plays the MIDI output messages (that is, the designated sound and the background sound) from the VOS processing device 23 using a MIDI module, a Software MIDI, and a FM synthesizer.

Then, the virtual orchestra playing method will be concretely described in the following, which plural users can play each their own musical instrument in the network, such as internet or intranet, using the VOS file converted from MIDI file or some other sources for each musical instrument.

In the preferred embodiment of the present invention, the VOS file, which is classified depending on the playing order and the musical instruments for the music, is preferably classified into track messages for piano, violin, drum, trumpet, Korean gong, etc., as illustrated in FIG. 8.

Here, the classification function (VOS file generating function) is to classify and store the ready made or created music on the basis of the musical instruments to be played with, editing and classifying the track from the MIDI file on the basis of musical instruments.

On the other hand, as shown in FIG 4, since the VOS file has data which are classified depending on tracks from ordinary music, the data is displayed on the screen as a type of electronic

score at a real-time. Therefore, when there is a user input from the input device according to the playing order in the electronic score, the playing function determines the note corresponding to the input at a real-time by the terminal loaded with the VOS  
5 and outputs the MIDI output message to the MIDI output device  
25.

To accomplish a ensemble play function, in a single user playing mode, the user plays the designated sound of the selected musical instrument and the VOS system plays the sound of the rest  
10 of musical instruments (that is, background sound). On the other hand, in a multi-user playing mode, the user terminals with the VOS system may communicate with one another using communication protocol such as TCP/IP (Transmission Control Protocol/Internet Protocol), IPX (Internetworking Packet Exchange), and each user  
15 of the terminal with the VOS system may hear other sounds and plays his own musical instrument in accordance with it, therefore the virtual orchestra playing may be accomplished.

The abstract playing environment as shown in FIG. 9 may be implemented by a playing environment as shown in FIG. 10.

20 The VOS installed terminal may be a PC or a portable computer (notebook PC) with a operating system such as Windows or Linux.

As an input device, a common keyboard, a keypad (that is, joypad with more than seven buttons as an option), or a well-known MIDI instrument may be employed.

25 For the MIDI output device, a direct music (a software MIDI system for users without MIDI modules) or a hardware MIDI module producing a high quality sound with high quality musical

instrument sound fonts (such as the sound canvas, FM synthesizer, etc.) may be employed.

In this real VOS playing environment, the terminals communicate with one another using network protocols such as  
5 TCP/IP, IPX, etc.

The VOS playing process in accordance with the present invention will be described in the following.

Fig. 11 is a flowchart of an embodiment of the musical playing method in accordance with the present invention which  
10 shows the VOS playing process using the VOS file.

As illustrated in FIG. 11, in a first step of the VOS playing method in accordance with the present invention, a list of music stored in the system is provided to the user, and then the music to be played is selected by the user through an input device at  
15 step 601.

The VOS file generated through the above process is provided by the VOS file providing device 24, and information for playing of musical instruments and advertisement are loaded from the VOS file at step 602, then the loaded information for playing and  
20 advertisement are stored to a main memory device which has fast access time enough to use the information at a real-time at step 603.

Then, the musical instruments list for the selected music is provided to the user, and one of the musical instruments is  
25 selected by the user at step 604.

The electronic score for the musical instrument played by the user is displayed on the screen display device 22 at step

605. The electronic score may be scrolled according to the progress of playing in order to show the spot to be played, in case where the music is too long to show all the electronic score displayed on a screen. The progress of displaying the electronic score is illustrated in FIG. 12. That is, the notes of part A  
5 score is illustrated in FIG. 12. That is, the notes of part A may be converted to those of B in the electronic score.

Then, at step 606 the VOS processing device 23 recognizes the playing operation inputted by user, when the user plays with the input device 21 according to the electronic score on the  
10 screen display device 22.

Then, for the musical instruments to be played by the user, the VOS processing device 23 outputs the notes corresponding to key inputs from the user at a real-time (that is, the MIDI output messages of the designated sound) to the MIDI output device 25  
15 at step 607, and for the rest of the musical instruments to be played by the user, outputs the notes (that is, the MIDI output messages of the background sound) automatically to the MIDI output device 25 at step 608. For the electronic musical score without there being a simplification, for example, for playing  
20 with the real MIDI musical instruments, the inputs go out directly to the user, without any simplification. For the simplified version of electronic musical score, the notes nearest to it may be sent to the user as an output.

For example, as illustrated in FIG. 13, if the user put downs  
25 'Do' after a lapse of 100s (C) from the starting point, and if 'Do' of the 5th (b) octave exists at a position after a lapse 90s, and that of 6th octave (a) should be at the 105s, the notes

nearer to the user input (a), that is, the note after a lapse of 105s may be decided to be played.

Finally, the sound corresponding to the notes played by the user with a musical instrument and the background sound corresponding to the notes played by the VOS processing device 5 23 automatically, not by the user, are mixed at a real-time by the MIDI output device 25, and go out through the speaker 26 at step 609. During this processing, the achievement or grade of the users' play, compared with the original music 9b, can be shown 10 as illustrated in FIG. 14 at step 610.

As stated in the above description, in the single player mode, displaying the electronic musical score at step 605, receiving the input from the user at step 606, outputting the designated sound of selected musical instrument at step 607, 15 outputting the designated sound of unselected musical instruments automatically at step 608, making the ensemble process at step 609 are repeated until the end of the playing.

On the other hand, in the double player mode, the ensemble is realized by mixing the designated sound of the selected musical 20 instruments of the first and the second player with unselected musical instruments at a real-time and by making each player listen to the other's sound through the computer network. And, it is obvious that the ensemble with more than two players may be implemented in the same way.

25 As stated above, the present invention provides the ensemble play for the whole music by generating the VOS file from the MIDI file or other sources corresponding to it, which is

classified depending on the musical instruments and by making the users play each their musical instrument in the network environment based on the VOS file. It means an overlap of the sound effect corresponding to the playing operation of the  
5 designated sound directed by the users and the background sound provided by the system.

Since the present invention directs the timing of playing operation visually to the users thereof, not only the skilled player but also the ordinary people may play the music more easily,  
10 and the present invention may also adjust the complexity of playing by adding or deleting the input keys and make advanced sound effect such as a scratch effect. Also, in accordance with the present invention, the result is evaluated by comparing the playing operation directed to the users with the real operation  
15 by users, and is given to users as a feedback, so the present invention has usefulness not only for amusement but also for competition to get better grade.

The present invention may be implemented by the single user mode or the multi-user mode not only in the network but also a  
20 noraebang (karaoke), a game room, an arcade and a digital satellite broadcasting network.

Referring to Fig. 15, in an application for noraebang (karaoke), the VOS installed karaoke system is used for terminals, and the VOS controllers (preferably, simulative musical  
25 instruments such as keyboard instruments, stringed instruments, percussion instruments, wind instruments) for noraebang (karaoke) with ten or more buttons or other devices may be used

for the input device. For output device, a well-known output system in karaoke may be used without change. The communication system may be achieved by the network system among the karaoke devices.

5        On the other hand, in game rooms, by installing the VOS system in each terminal, a single user or plural users may play the music using each their own terminal.

         In arcades, by inserting coins, a selected music may be played with hands or feet, and the game may be continued according  
10    to the grade of game. In the digital satellite broadcasting system, the VOS player is installed on the set top box, the information on the selected music is transmitted from the digital satellite, and then the electronic musical score is displayed on the TV screen, therefore the music may be played according  
15    to the score.

         In this embodiment which one or more users play the music according to the electronic musical score displayed on the screen using computer system, although the simplification of playing music is supposed so that one may play some musical instruments  
20    without much training, the wide range adjustment of complexity is possible by extending the musical range to two or five octaves, and it is obvious that such a transformation has the same effect as the embodiment of the present invention and is within the technical aspect of the present invention. Also, the MIDI  
25    instrument may be used for an input device because the MIDI instrument doesn't make real sound but send out signals for sound, and the correctness of the playing the MIDI instrument may be



compared with the real musical score. Further, feet as well as hands may be used as an input. Also, the simulative musical instruments used in a noraebang (karaoke), a game room, an arcade can be made in the shape of real musical instruments for  
5 amusement.

#### Industrial Applicability

As apparent from the above description, according to the  
10 present invention, various musical instruments may be played more easily by forming the VOS file from the well-known MIDI file, and the ensemble is possible among a group of people making an advantage of chatting. And even unskilled people who are not trained for some musical instruments are able to play the music,  
15 and virtual orchestra may be implemented without any expensive real musical instruments, studio, or other equipments within the network environment such as internet or intranet.

The present invention does not confined to the said embodiments or attached figures, and it is clear that the  
20 replacement, transformation or modification is possible for the skilled man in the art within the technical aspect of the present invention.

Claims

1. A music playing system supporting users to play music  
5 for a selected musical instrument based on the computing system,  
comprising;

music file providing means for providing a music file to  
represent notes for each musical instrument at the timing of  
playing operation by classifying the notes depending on a playing  
10 order and a track corresponding to the musical instrument for  
said music;

musical score display means for displaying each note for  
the musical instrument to be played as an electronic musical  
score;

15 at least one playing operation input means for getting an  
playing operation input from the users according to the playing  
order of notes in the electronic musical score displayed by said  
musical score display means;

musical processing means for storing a digital music file,  
20 converting the notes in a score to the electronic musical score  
representing the playing order, and providing the notes to the  
musical score display means, and outputting a designated sound  
manipulated by the playing operation input means and the  
background sound except the designated sound;

25 music playing means for synthesizing and playing the  
designated sound and the background sound from the musical  
processing means; and

output means for outputting the music played by the music playing means.

2. The music playing system of Claim 1, wherein the musical  
5 processing means has musical data classified depending on the track of the musical instrument and display the electronic musical score on the musical score display means at a real-time, wherein the musical processing means provides, in a single user mode, the designated sound of the user according to the electronic  
10 musical score and the background sound to the music playing means in the type of MIDI output message; and

provides, in a multi user mode, the designated sound of the users according to the electronic musical score and the background sound to the music playing means in the type of MIDI  
15 output message;

3. The music playing system of Claim 1 or 2, wherein the music playing means make an ensemble play in a single user mode, by mixing the designated sound from the musical processing means  
20 with the background sound and playing the music and, in a multi user mode, by mixing the designated sounds of the plural users from the musical processing means with the background sounds of the users.

25 4. The music playing system of Claim 3, wherein said electronic musical score is a digital electronic musical score, visually directs the playing order by scrolling a part of the

musical score to be played according to playing time, and inputs adjusts a complexity of the key for each musical instrument.

5        5. The music playing system of Claim 4, wherein the electronic musical score is a digital electronic musical score, visually directs the playing order by scrolling the part of the musical score to be played according to playing time, a range of all the notes to one octave by deleting the octave element in notes to degrade the complexity of key input for each musical  
10        instrument, and changes all the semi-tones to whole-tones.

6. The music playing system of Claim 4, wherein the electronic musical score is a digital electronic musical score, visually directs the playing order by scrolling the part of the  
15        musical score to be played according to playing time, and the range of all the notes extends to two to five octaves by increasing the input keys to upgrade the complexity of key input for each musical instrument.

20        7. The music playing system of Claim 4, wherein the at least one playing operation input means are at least one terminals providing the playing operation inputted by hands or feet of user according to the playing order of notes in said electronic musical score displayed on the musical score display means to the musical  
25        processing means.

8. The music playing system of Claim 7, wherein the

computing system is for well known commercial network, a noraebang (karaoke), a game rooms, or the digital satellite broadcasting system.

5        9. The music playing system of Claim 8, wherein the music includes ready made and created music.

10. A music playing method in computing system, comprising the steps of:

10        a) generating music file representing the notes in the timing of playing order by partitioning the notes depending on the track of the playing order and musical instrument for the music;

15        b) getting inputs of the title of music and the musical instrument to be played from users;

      c) displaying electronic musical notes for musical instruments to be played as an electronic musical score that shows the playing order of the notes on a screen at a real-time; and

20        d) synthesizing and playing the designated sound manipulated by users and the background sound except the designated sound according to the musical score displayed on the screen.

11. The music playing method of Claim 11, wherein, in  
25        single user mode, the step d) mixes the designated sound of the user according to the electronic musical score and the background sound, and play said music, in multi user mode, mixes the

designated sounds of plural users according to the musical score and the background sounds, and play the music.

12. The music playing method of Claim 11, wherein the step

5 a) includes the steps of:

a1) classifying MIDI messages by type and storing them in memory to get the necessary information from musical message stored in the MIDI files;

10 a2) converting the delta time information in the MIDI files to the absolute time information and classifying the users based on the relation to the musical instruments;

a3) generating the electronic score by simplifying the playing style to make it easy to play the musical instruments; and

15 a4) generating the music file by changing the position of notes, omitting notes needed, coordinating the complexity of playing, in the generated score through the step a3).

13. The music playing method of Claim 12, further including  
20 the step of after the step a3) inserting the additional information (advertising message, image, or sound clip for some corporations, goods, music) to the complexity coordinated musical score and deciding the time to show each additional information to users.

25

14. The music playing method of Claim 12, wherein the step a3) includes the step of deleting the octave element in notes

so that the range of all the notes can be confined to one octave, and changing the semi-tones to the whole-tones.

15        15. The music playing method of Claim 14, wherein the electronic musical score is a digital electronic musical score, visually directs the playing order by scrolling the part of the musical score to be played according to playing time, and a complexity of key inputs adjusts for each musical instrument.

10        16. The music playing method of Claim 15, wherein the electronic musical score is a digital electronic musical score, visually directs the playing order by scrolling the part of said musical score to be played according to time, a range of all the notes confines to one octave by deleting the octave element in  
15 notes to degrade the complexity of key input for each musical instrument, and all the semi-tones changed to whole-tones.

17. The music playing method of Claim 15, wherein the electronic musical score is a digital electronic musical score,  
20 visually directs the playing order by scrolling the part of said musical score to be played according to playing time, and the range of all the notes extends to two or three octaves by increasing the input keys to upgrade the complexity of key input for each musical instrument.

25

18. The music playing method of Claim 15, wherein the computing system is for well known commercial network, a

noraebang (karaoke), a game room, or the digital satellite broadcasting system.

19. The music playing system of Claim 18, wherein the music  
5 includes ready made and created music.

20. A method for converting a digital music file to a music playing file for each musical instrument, comprising the steps of:

10 a) classifying MIDI messages in MIDI files by type and storing them to memory;

b) converting the delta time information of MIDI message to the absolute time information; and

c) generating a VOS file by constructing a playing note  
15 message.

21. The method for converting a digital music file to a music playing file for each musical instrument of Claim 20, wherein the message includes control message, playing message, and  
20 musical instrument configuration message.

22. The method for converting a digital music file to a music playing file for each musical instrument of Claim 20, wherein the step b) includes the steps of:

25 b1) generating a electronic score by simplifying the playing style to make it easy to play the musical instruments; and



b2) generating the music file, which represents the musical notes to be played for each musical instrument according to the playing timing by classifying the notes depending on the playing order and musical instrument (track), by changing the position of notes, omitting notes needed, coordinating the complexity of playing in the generated electronic musical score through the step b1).

23. The method for converting a digital music file to a music playing file for each musical instrument of Claim 22, wherein the step b) further includes the step of b3) inserting the additional information (advertising message, image, or sound clip for some corporations, goods, music) to the complexity coordinated musical score and deciding the time to show each additional information to users.

24. In a device with a processor that converts digital music files to music playing files for each musical instrument, a computer readable medium storing instructions for realizing the functions of:

a) classifying MIDI message in MIDI files and storing them to memory;

b) converting the delta time information of MIDI message to the absolute time information; and

c) generating a VOS file by constructing a playing note message.

25. In a device with a processor that partitions notes depending on musical instruments and stores them, a computer readable medium storing instructions for realizing the functions of:

- 5           a) classifying MIDI message and storing them to memory for obtaining necessary information from the message of MIDI file, in the apparatus with processor which converts a digital music file to a music playing file to be played for each musical instrument;
- 10          b) carrying out the time conversion which change the delta time information to the absolute time information, and the classification of users based on relation to the musical instruments;
- c) generating a electronic score by simplifying the playing  
15 style to make it easy to play the musical instruments; and
- d) generating a digital music file, which represents the notes in the timing of playing operation by partitioning the notes according to the playing order and musical instrument (track), from the generated electronic musical score by changing  
20 the position of the notes, omitting some notes, adjusting the complexity of performance.

26. The computer readable medium of Claim 25, further comprising the function of e) inserting additional information  
25 (advertising message, image, or sound clip for some corporations, goods, music) to said complexity coordinated musical score, and deciding the time to show the additional information to users.

27. In a music playing device with processor, a computer readable medium storing instructions for realizing the function of:

5       generating music files for representing the notes for the music in the timing of playing order by partitioning the notes according to the playing order and musical instrument (track) in the music playing device with processor;

      getting inputs of the title of music and the musical  
10 instrument to be played from users;

      displaying the musical notes for said music to be played as an electronic musical score that shows the playing order of the notes on a screen at a real-time; and

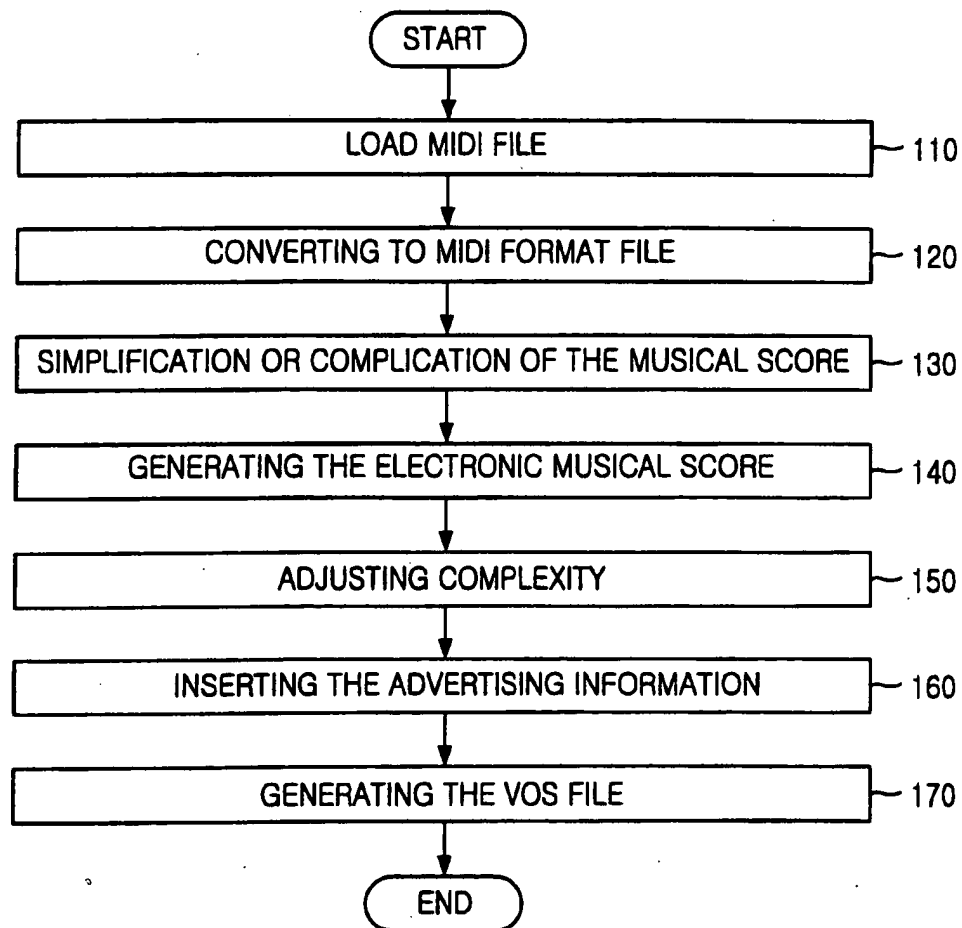
      synthesizing and playing the designated sound manipulated  
15 by users and the background sound except the designated sound according to the musical score displayed on the screen.

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FIG.1

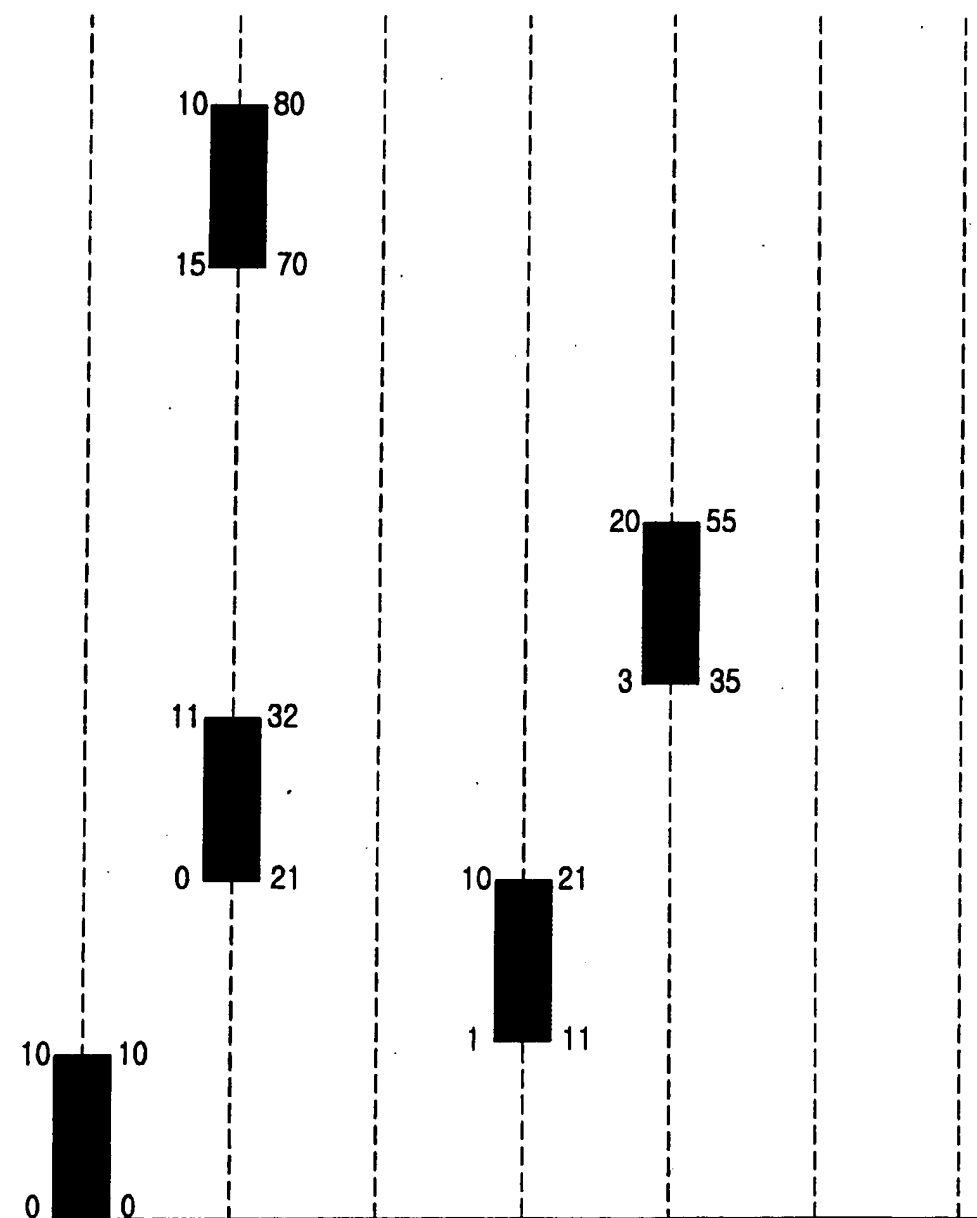


FIG.2



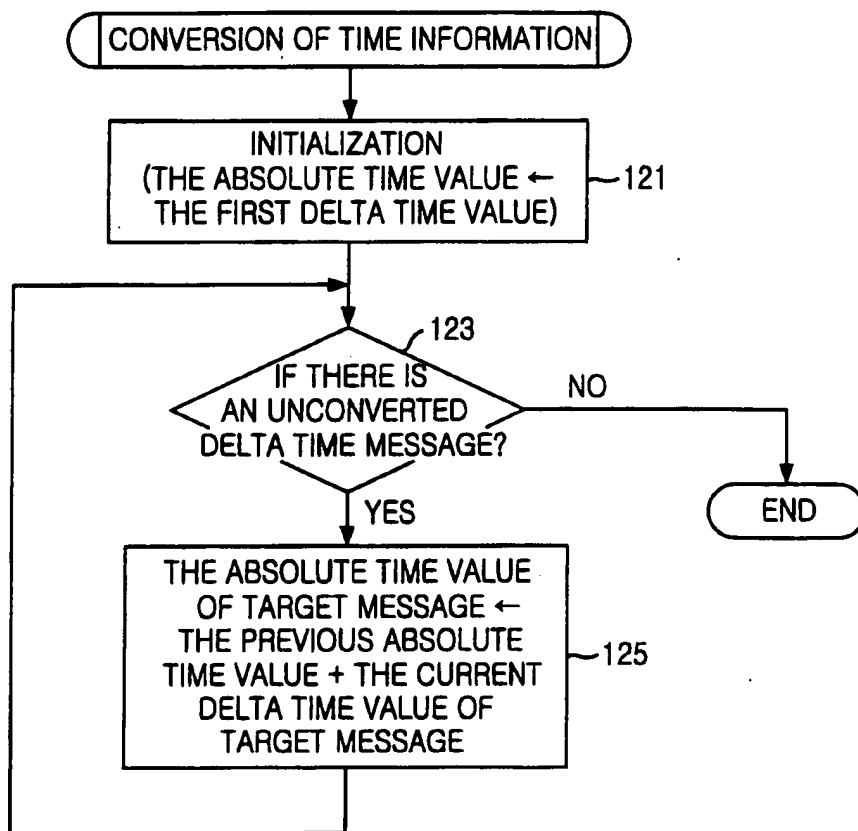
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FIG. 3



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FIG. 4



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FIG. 5

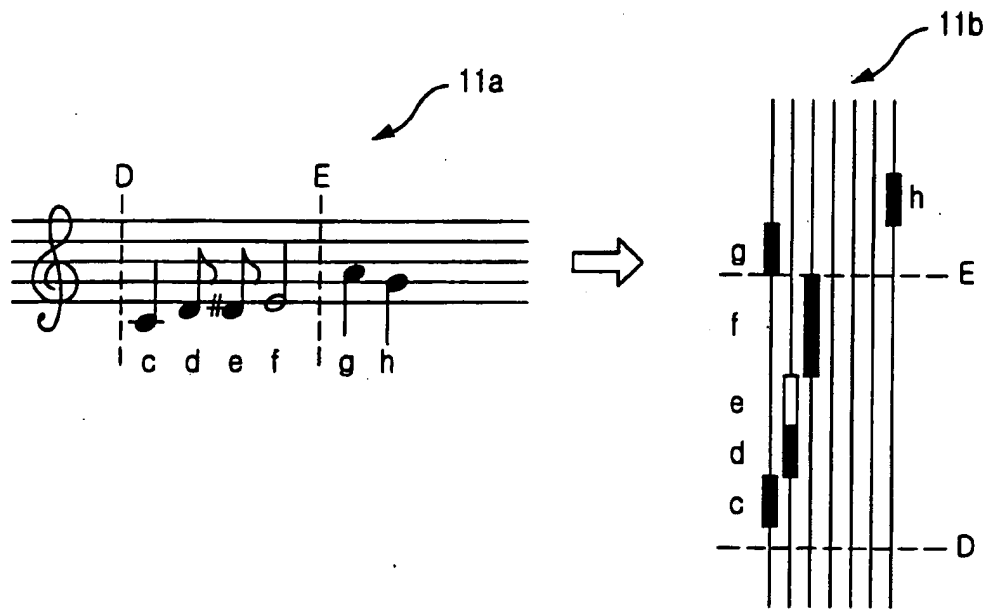
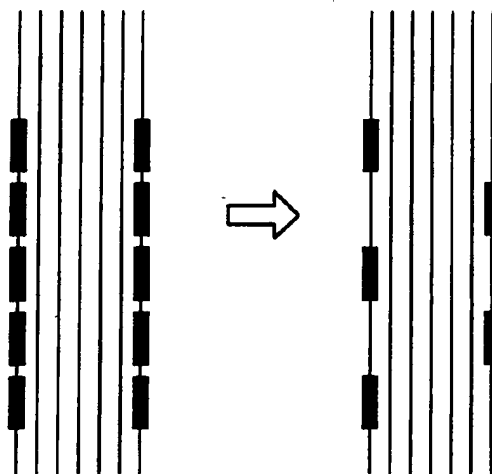
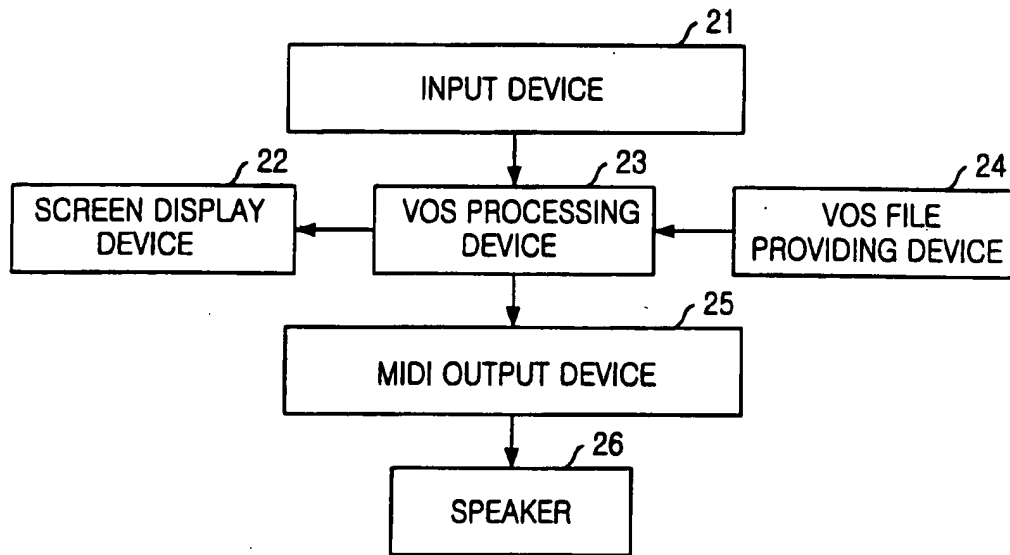


FIG. 6



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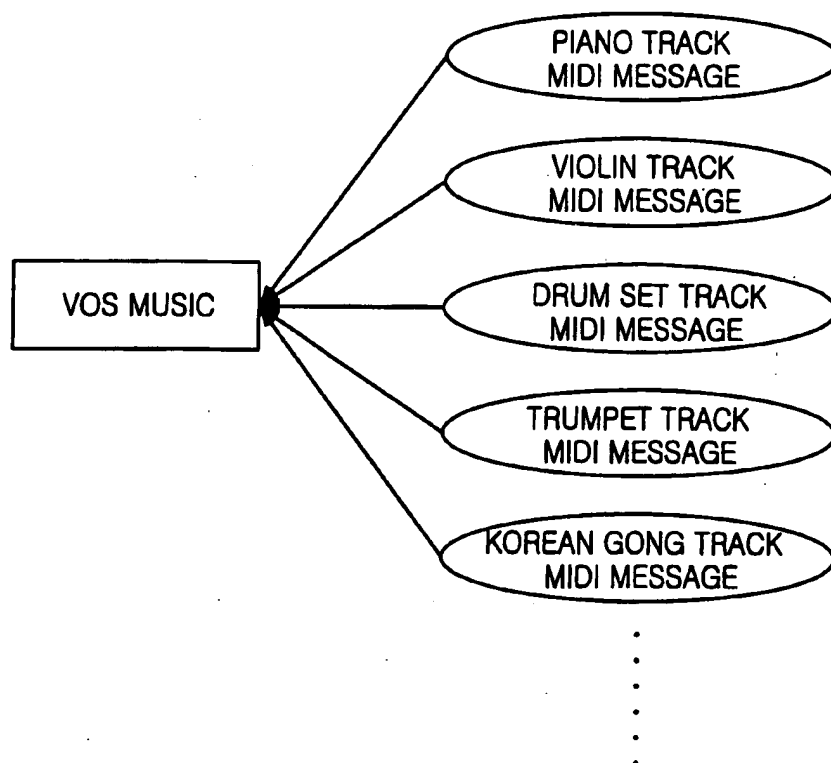
FIG. 7





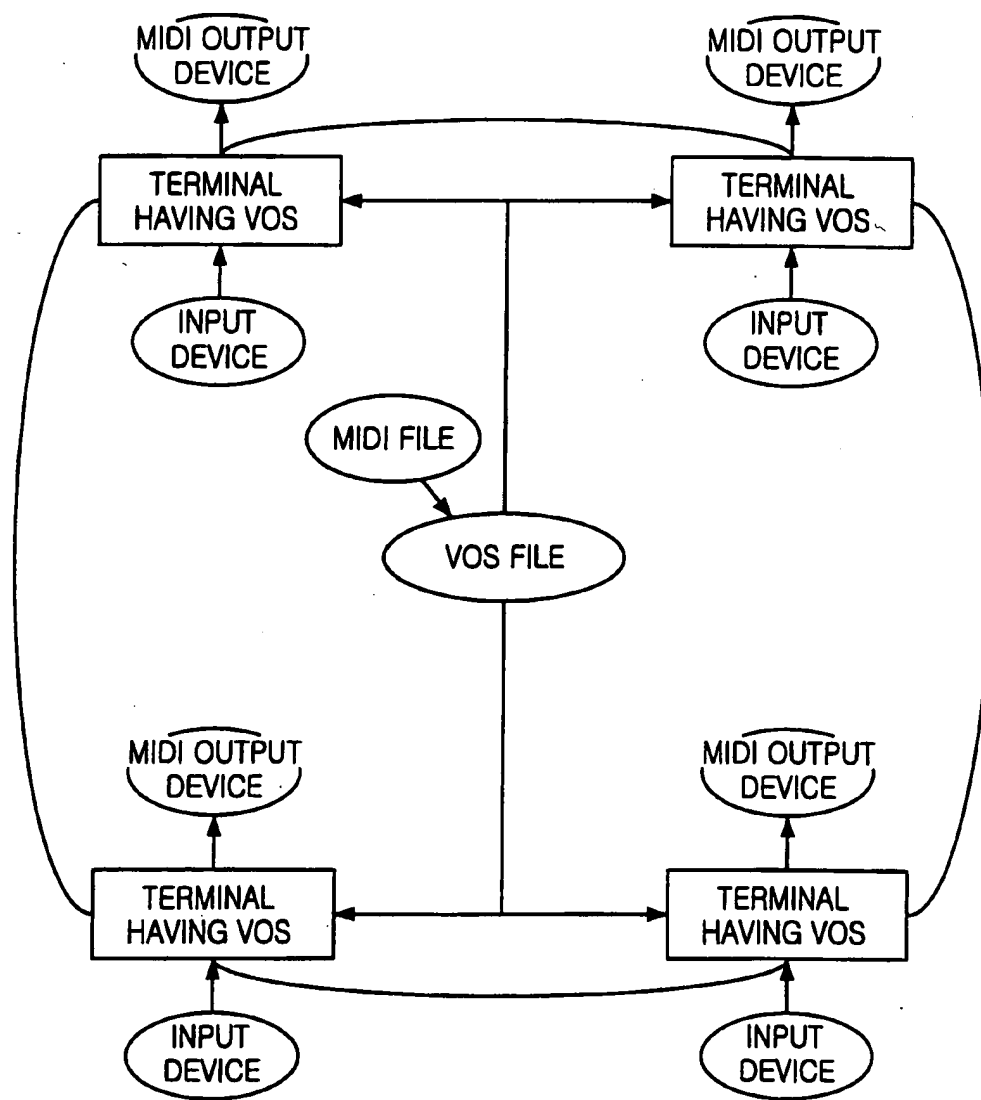
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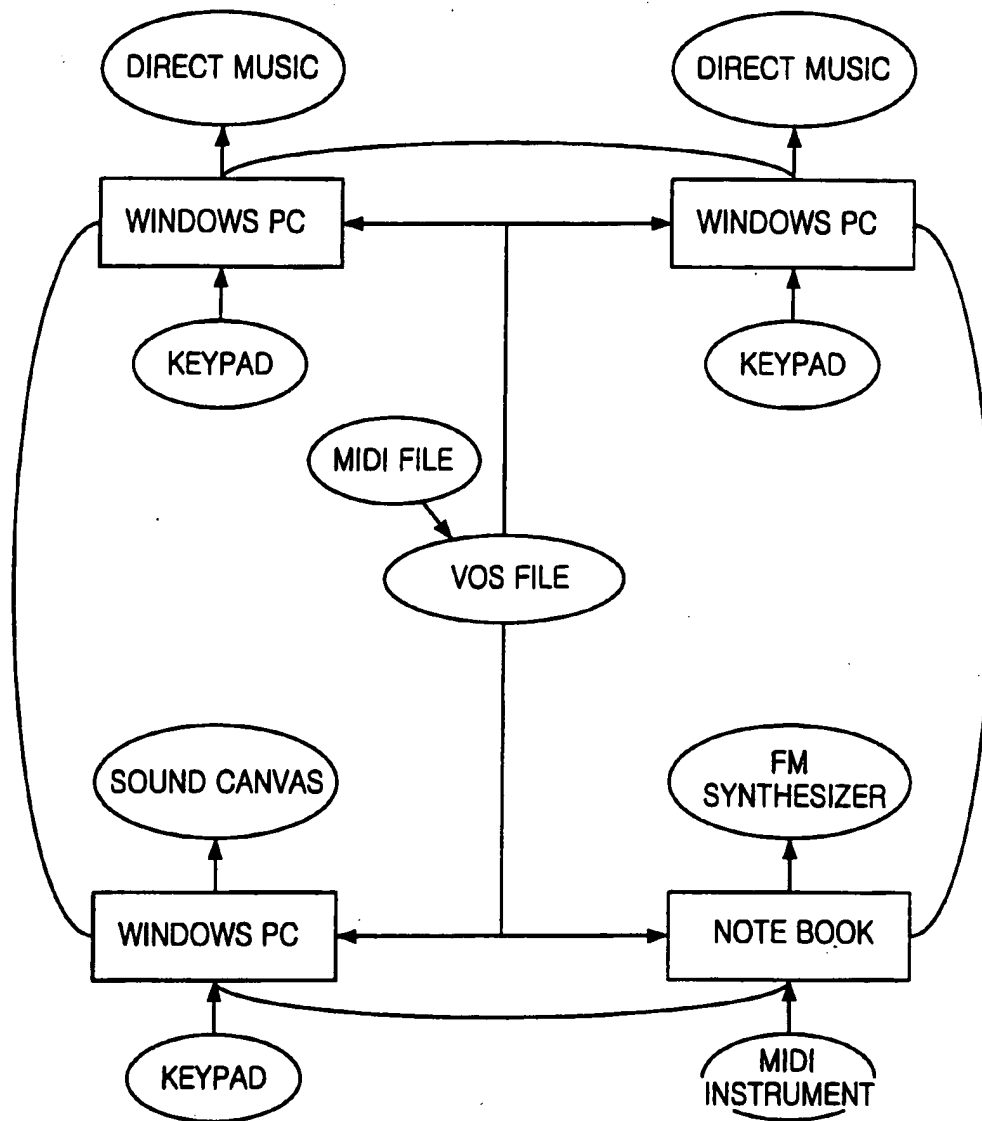
FIG. 8



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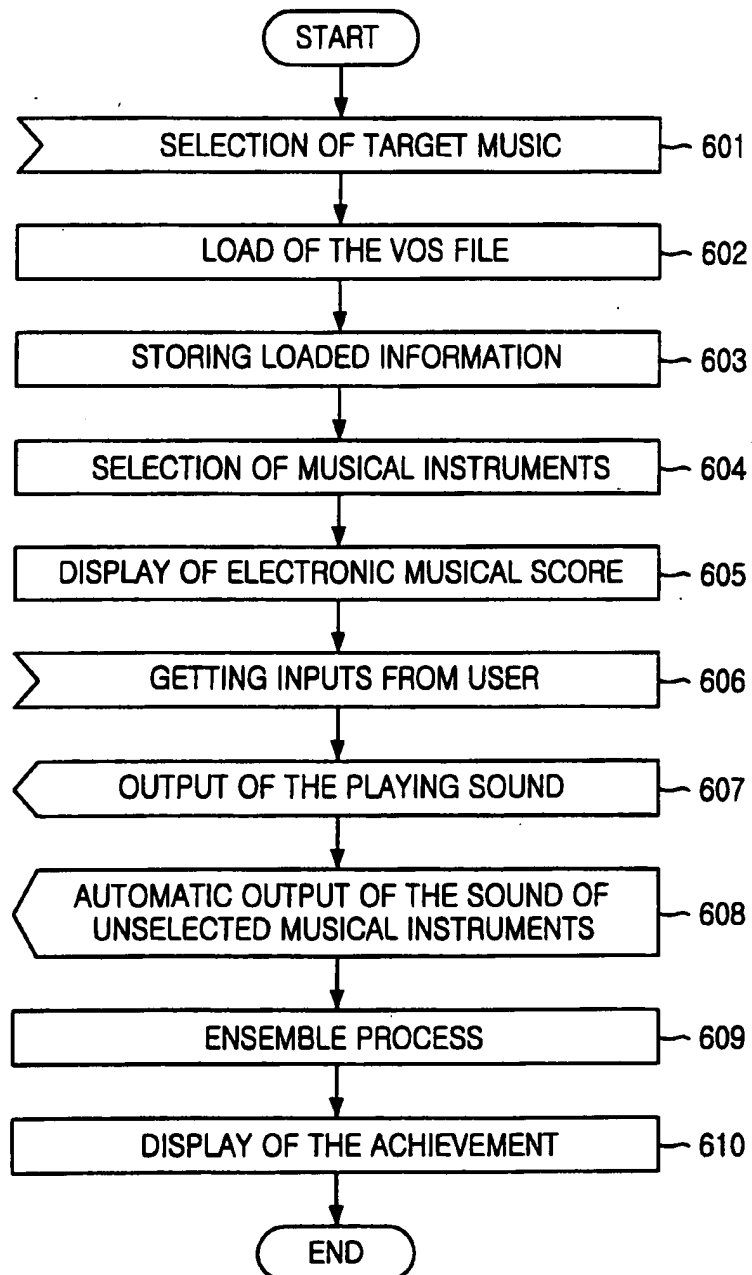
FIG. 9



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FIG. 10

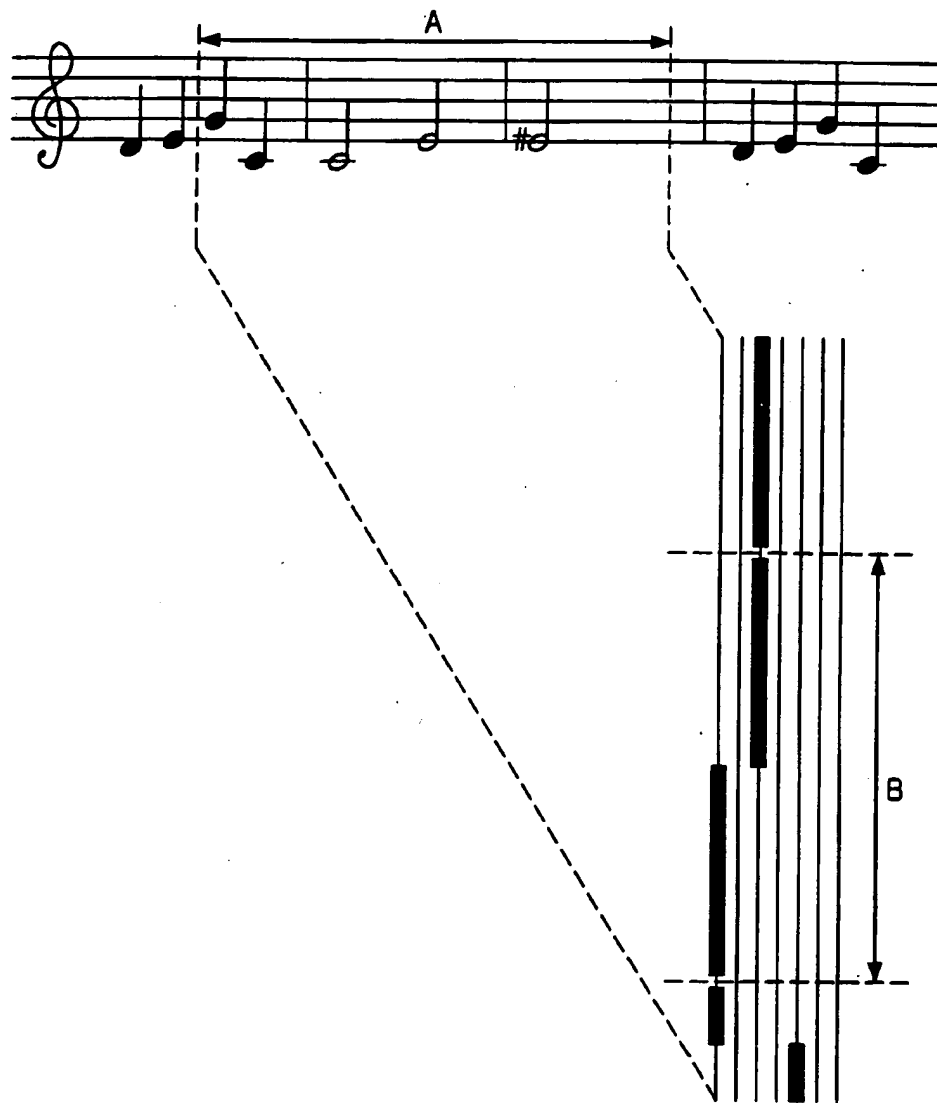
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FIG. 11



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FIG. 12



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FIG. 13

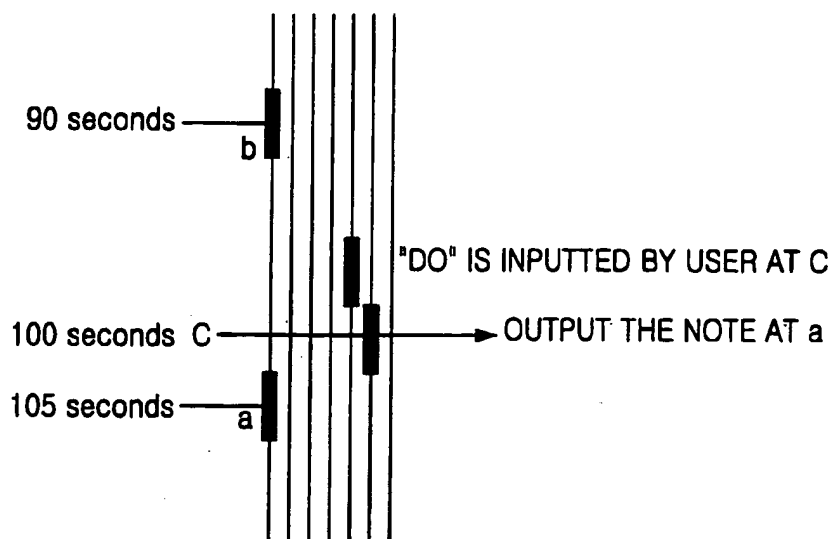
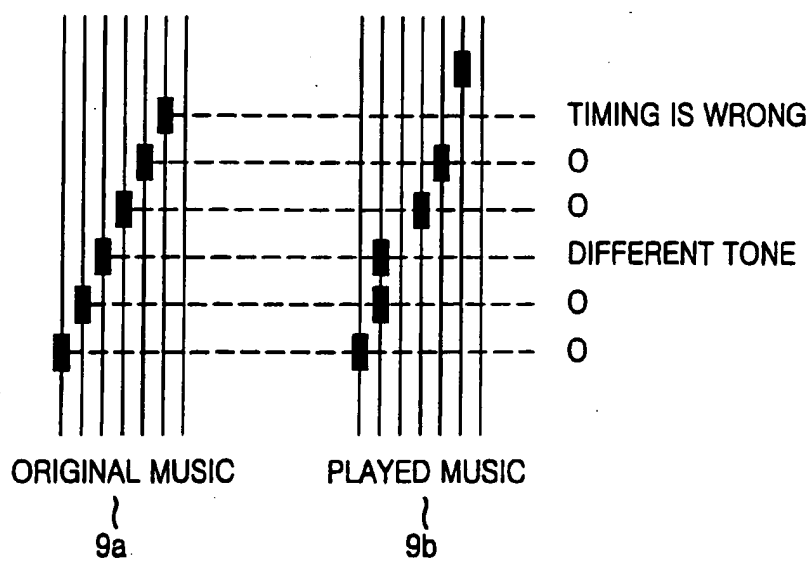
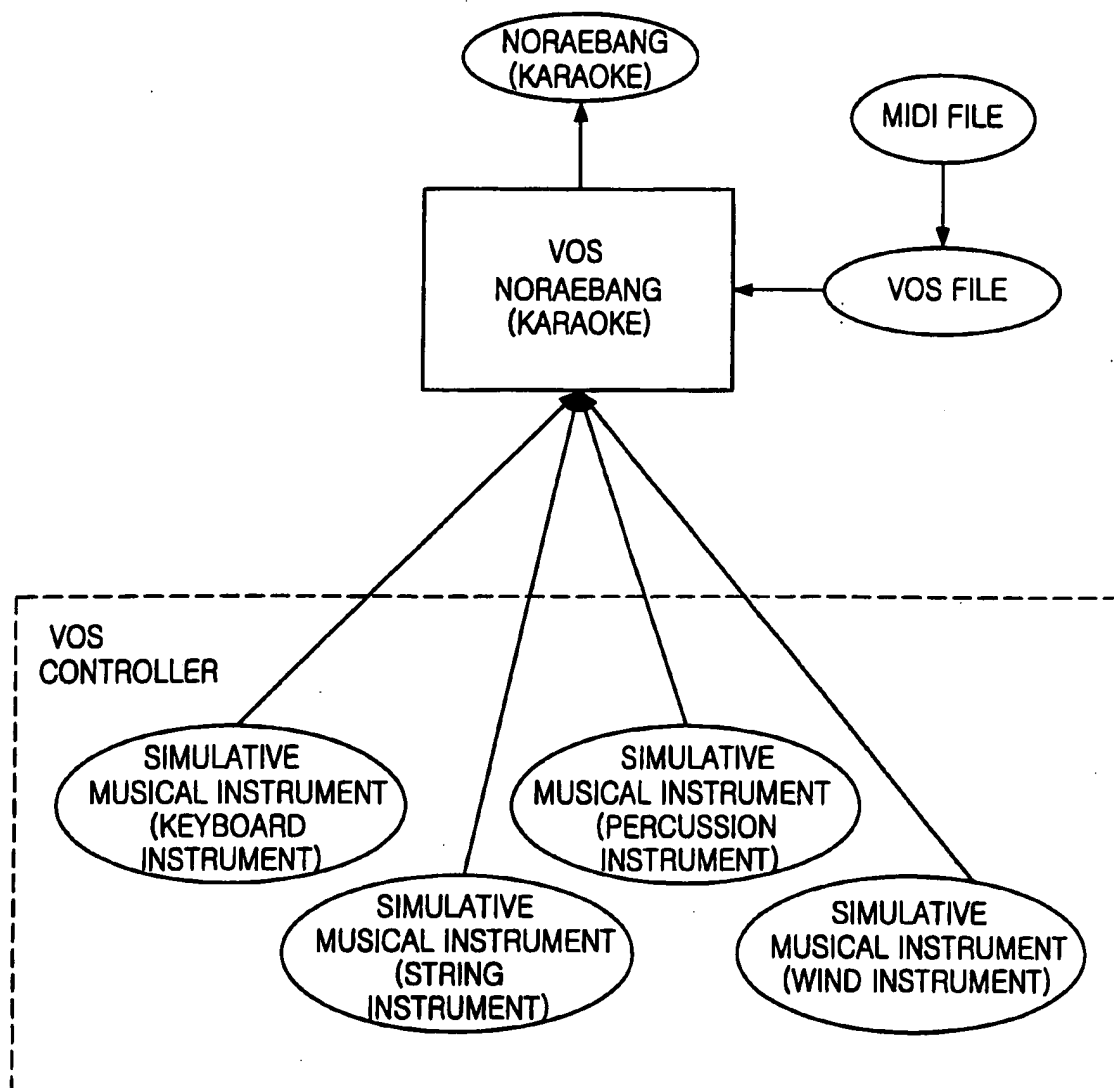


FIG. 14



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FIG. 15



# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/KR00/01042

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
IPC7 G10H 1/36		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols)		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US-A-5,744,740(Yamaha Corporation, Japan) 28 April 1998 * the whole document *	1-27
A	EP-A-0 484 046(International Business Machines Corporation) 23 October 1991 * the whole document *	1-27
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p>		
Date of the actual completion of the international search 29 DECEMBER 2000 (29.12.2000)		Date of mailing of the international search report 30 DECEMBER 2000 (30.12.2000)
Name and mailing address of the ISA/KR Korean Industrial Property Office Government Complex-Taejon, Dunsan-dong, So-ku, Taejon Metropolitan City 302-701, Republic of Korea Facsimile No. 82-42-472-7140		Authorized officer NAM, In Ho Telephone No. 82-42-481-5761

